

## Predictors of Growth Mindset among Ghanaian Classroom College of Education Teacher Trainees

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**Abstract:** The study aimed to examine the important predictors of Ghanaian classroom Diploma in Basic Education teacher trainees' growth mindset toward student learning. Participants included a purposive sample of 328 (177 male and 151 female) second- and third-year teacher trainees in one college of education in the northern part of Ghana. The predictor variables were the type of program, year in program, age, sex, and marital status. The student learning subscale of the Physical Education and Sports Ability Survey (Sofo et al., 2016) served as the main data source. The items were adapted for the classroom setting. Most of the trainees had a growth mindset but with some fixed ideas for student learning (80.18%). Approximately 19.21% of the trainees had a strong growth mindset in student learning. The mean decreased Gini (MDG) values for the year in the program, program type, and marital status (married vs. single) showed that these predictors were important for student learning. A logistic regression analysis showed that type of program, year in program, and marital status were significant predictors of growth mindset for student learning. Trainees in the early childhood program were approximately seven times more likely to have a growth mindset regarding student learning compared to those in the primary education program. Trainees in their third year were approximately 145 times more likely to have a growth mindset regarding student learning compared to trainees in their second year. Single teacher trainees were approximately 213 times more likely to have a growth mindset regarding student learning compared to married teacher trainees. The study provides insights for teacher educators regarding the profiles and factors that promote the development of a growth mindset in teacher education settings in Ghana.

**Keywords:** Growth mindset, teacher education, Ghana, Random Forests

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## Introduction

### Importance of a Growth Mindset in Education

The concept of a growth mindset has received significant attention in the field of education (Dweck, 2006). A person with a growth mindset believes that abilities and intelligence can be developed through effort, learning, and perseverance (Dweck, 2006). This contrasts with a fixed mindset, where individuals believe that their abilities are static and cannot be changed significantly. Adoption of a growth mindset has been shown to have a significant effect on students' motivation, learning, and overall academic success (Blackwell et al., 2007; Dweck, 2008).

#### *The Ghanaian Context of Teacher Education*

Ghana places a strong focus on the education of its youth, recognizing that well-trained teachers are essential to achieving educational goals and national development (Ministry of Education, Ghana, 2019). However, these policies, infrastructure, overcrowded classrooms, and the need to continuously improve teaching practices (Anamuah-Mensah, 2019). There is a need to formulate effective and contextually meaningful policies as these play an important role in the determination of educational attitudes and practices. Ghanaian society places a high value on education, and students often face tremendous pressure to excel academically (Adu-Gyamfi & Walker, 2019).

#### *The Need to Understand Predictors of a Growth Mindset*

One topic that has not been studied in education in Ghana is the need to understand the predictors of a growth mindset among prospective teachers. A growth mindset, characterized by the belief in the malleability of one's abilities through effort and learning (Dweck, 2006), is not a uniform trait but a dynamic construct influenced by various factors (Yeager & Dweck, 2012). Previous studies have identified possible predictors of growth mindset as the teacher's sociocultural background, prior academic experiences, and instructional practices (Blackwell et al., 2007; Hong, 2013; Sisk et al., 2018). For example, instructional approaches that emphasize effort and learning from mistakes would more likely promote a growth mindset. However, the interaction and relative contribution of these predictors in the context of teacher education are unclear. An understanding of these predictors is essential because it can inform targeted interventions and curriculum enhancements to foster growth mindsets among teacher trainees, ultimately benefiting their students' learning experiences (Haimovitz & Dweck, 2016).

#### *Relevance to Teacher Education in Ghana*

As mentioned earlier, Ghana places great emphasis on the quality of its teachers and recognizes that teacher education programs play an important role in shaping the country's educational future (Ministry of Education,

Ghana, 2019). A growth mindset among teacher trainees can help them with the knowledge and efficacy of student learning. In the Ghanaian context, where education is highly valued, the pressure to excel academically can sometimes create a fixed mindset and fear of failure among students (Adu-Gyamfi & Walker, 2019). In addition, a developmental perspective can provide teachers with the flexibility needed to overcome challenges in the education system in Ghana, including overcrowded classrooms and infrastructure (Anamuah-Mensah, 2019).

### *Purpose of the Study*

The study examined the important predictors of Ghanaian classroom Diploma in Basic Education teacher trainees' growth mindset toward student learning. The findings can provide insights regarding the factors that promote the development of a growth mindset among teacher trainees in Ghana. This, in turn, can empower policymakers and educators to design and implement appropriate interventions.

### *Research Questions*

The following research questions guided the study:

1. What are the growth mindset profiles of Ghanaian classroom teacher trainees?
2. What are the important predictors of Ghanaian classroom teacher trainees' growth mindset for student learning?

## **Method**

### **Participants**

Participants included a purposive sample of 328 (177 male and 151 female) second-year (152) and third-year (176) teacher trainees enrolled in a Diploma in Basic Education program at one college of education in the northern part of Ghana. They were aged 19-35 years ( $M= 24.45$ ;  $SD= 2.36$ ). age. The trainees were enrolled in the General Basic (Primary) Education (178) and Early Childhood Education (150) programs at the time of the study.

### *Instrument and Variables*

The student learning subscale of the Physical Education and Sports Ability Survey (PESAS) (Sofo et al., 2016) served as the main data source. The PESAS was, in turn, developed from the Dweck Mindset Inventory (Dweck, 2006). The items were adapted for the classroom setting. The student learning subscale consisted of 12 items on a 4-point scale of strongly agree (4), agree (3), disagree (2), and strongly agree (1), with "4" being the highest and "1" the lowest for items that were positively stated. The teacher trainees' growth mindset toward student learning and teaching ability served as the response variables. The predictor variables were the type of program, year in program, age, sex, and marital status.

## Statistical Analysis

### Random Forest Parameters and Evaluation Metric

For all the models estimated using the random forest algorithm for classification, we used the square root of the number of predictors and rounded to the nearest whole number as the number of predictors randomly sampled as candidates at each split (James et al., 2021). We set the variable importance argument to TRUE in the “randomForest()” function and the number of trees was set to the default of 500. The evaluation metric for the random forests for classification was the Out-of-bag (OOB) error metric. This metric measures the prediction error rate for the random forests method. The OOB estimate for the error rate for student learning was 14.33%.

### *Predictor Importance and Logistic Regression*

We used the mean decrease Gini (MDG) value (cut-off point = 10) to determine predictor importance. The higher the value, the greater the importance of the predictor. Predictors with MDG values of at least 10 were important. For student learning, year in program, program, and marital status (married vs single) were important predictors according to their MDG values.

For robustness, and to obtain a more interpretable model to guide practitioners, we estimated the binary logistic regression model and obtained the estimated Odds Ratios and their corresponding 95% confidence intervals. Results of the logistic regression were consistent with the random forests results and hence serve as a check for the robustness of our results.

## Results

### Teacher Trainees' Growth Mindset Profiles for Student Learning

The first research question examined the growth mindset profiles of Ghanaian classroom teacher trainees. Table 1 shows data on teacher trainees' growth mindset profiles for student learning. Most of the trainees had a growth mindset but with some fixed ideas for teaching ability (80.18%). A little over 19 percent of the trainees had a strong growth mindset in student learning. Conversely, only approximately .31% of the trainees had a strong fixed mindset or a fixed mindset with growth ideas.

Table 1. Teacher trainees' growth mindset profiles for student learning

Category	Frequency	Percent
Strong Fixed Mindset	1	0.305
Fixed Mindset with Growth Ideas	1	0.305
Growth Mindset with Fixed Ideas	263	80.183
Strong Growth Mindset	63	19.210
Total	328	100.00

*Important Predictors of Teacher Trainees' Growth Mindset*

Table 2 represents the Mean Decreased Gini (MDG) for the predictor variables. Year in program had the highest MDG of 49.20, followed by marital status (Single versus Married). Using a cut-off point of 10 shows that the MDG values for the year in the program, program type, and marital status (married vs. single) showed that these predictors were important for student learning. Alternatively, teacher trainees' sex, age, and marital status (Single versus Other) were not important predictors of teacher trainees' growth mindset for student learning.

Table 2. Mean Decrease Gini values based on Random Forests Methods

Predictors	MDG
Program (Early Childhood vs Primary)	10.49
Year in Program (3 <sup>rd</sup> vs 2 <sup>nd</sup> )	49.20
Age (More than 25 years)	3.31
Sex (Female vs Male)	2.04
Marital Status (Married vs Single)	21.64
Marital Status (Other vs Single)	3.61

*Logistic regression for predictor variables and growth mindset*

We did a logistic regression analysis for the predictors that had MDG values of at least 10. The analysis showed that type of program, year in program, and marital status were significant predictors of growth mindset for student learning. Trainees in the early childhood program were approximately seven times more likely to have a growth mindset regarding student learning compared to those in the primary education program.

Trainees in their third year were approximately 145 times more likely to have a growth mindset regarding student learning compared to trainees in their second year. Single teacher trainees were approximately 213 times more likely to have a growth mindset regarding student learning compared to married teacher trainees.

Table 3. P-values and estimated odds ratios based on predictors with MDG  $\geq 10$ 

Predictor	P-value (Estimated)	Estimated Odds
	Log Odds)	Ratio
Year in Program (Year 3 vs Year 2)	0.000	144.877
Program (Early Childhood vs Primary)	0.000	6.782
Age (>25 vs <=25)	0.492	1.330
Sex (Female vs Male)	0.996	0.998
Marital Status (Married vs Single)	0.000	0.005
Marital Status (Other vs Single)	0.986	0.000

## Discussion

This study examined the important predictors of Ghanaian classroom Diploma in Basic Education teacher trainees' growth mindset toward student learning. Teacher trainees in the early childhood program were approximately seven times more likely to have a growth mindset regarding student learning compared to those in the primary education program. This may be attributed to the more visible growth and development early childhood education trainees observe in young children's abilities, which in turn, may strengthen their belief in the efficacy of a growth mindset approach. Trainees in their third year were more likely to have a growth mindset regarding student learning compared to trainees in their second year. The year three trainees having had more exposure and experience with children in real classrooms might have had a deeper understanding of growth mindset than their counterparts in their second year of training.

Another major finding of our study was that married teacher trainees exhibited lower growth mindset scores than their counterparts who were single. It is possible that single teacher trainees may perceive themselves to have greater control over their lives than married trainees. This perceived control may lead single trainees to have a stronger belief in their ability to change and improve, consistent with the principles of a growth mindset. Also, compared to married couples, single individuals generally have more personal freedom and independence. This autonomy can lead to a strong belief that they have control over their own abilities and can actively work to improve them, consistent with growth mindset principles.

The present study was conducted on teacher trainees in the Diploma in Basic Education program. This program has been phased out and replaced with the Bachelor of Education (B.Ed.) program at the colleges of education. Future research could be done on trainees pursuing the B.Ed. programs at the colleges of education. The growth mindset of prospective teachers in Ghanaian universities could also be investigated. Furthermore, studies comparing the growth mindset of teacher trainees in different teacher education programs are worth investigating.

## Conclusion

Our study revealed that three out of six predictors significantly influenced the development of a growth mindset in Ghanaian teacher trainees. Notably, the type of program, year in the program, and marital status significantly predicted their growth mindset regarding student learning. These findings provide important insights for teacher educators regarding the profiles and factors that promote the development of a growth mindset in teacher education settings in Ghana.

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